Using Casco Bay to understand local-scale changes in diversity among *Zostera marina* ecosystems

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One goal of community ecology is to discover the ways in which communities assemble (Hooper et al. 2006). Functional traits provide a broad perspective on this question. Violle et al. (2007), described functional traits as "any morphological, physiological, or phenological feature" which "impact[s] fitness (of an individual) indirectly." Functional traits broaden the possibilities for comparison by allowing for analysis to rely on a universal set of traits shared across groups of species rather than on the species that are present (Cadotte et al. 2015).

The clustering of traits, how similar they are to one another, can also provide information about an ecosystem; it can suggest the relative strength of abiotic and biotic pressures that can change the assembly of a community. The clustering of traits is correlated to the relevant assembly mechanism present within a system and can be used to better understand the strength of processes important in community assembly.

In this project, I aimed to quantify the uses of local scale measurements to better understand community assembly in *Zostera marina*. Epifauna are small invertebrates that feed on algae that blocks light from *Z. marina* blades. *Z. marina* is known to store carbon, prevent storm surges along coastlines, and act as a 'nursery' habitat for species like lobsters, clams, and mussels. Epifauna are key to this system; ensuring the ability of *Z. marina* to photosynthesize as they eat algae from the blades. Understanding the assembly of this community is important to maintaining the services that *Z. marina* provides.

Community assembly mechanisms are scale dependent; certain processes are more likely to occur at different scales. A recent study looked at global patterns of functional trait clustering and community assembly in *Z. marina* epifaunal communities and compared the Pacific and Atlantic (Gross et al. 2021). At the scale of this study, we would expect to see environmental filtering and dispersal limitations as the major drivers of community assembly, leading to higher levels of clustering. (de Bello et al. 2013; Götzenberger et al. 2016). In my study, I used sites in Casco Bay, ME, and Downeast, ME to make local and regional scale comparisons. I also was able to sample Salt Bay Marine Protected Area and provide an analysis of the site to its managers with the help of the Grua/O'Connell research fellowship. Salt Bay is isolated and warm; the faunal communities located there could differ drastically from its outer coast counterparts in terms of functional traits. Before my study, no data had been collected on how the communities in Salt Bay differ from those in Casco Bay.

I found that levels of clustering varied within sites and regions, but also was significantly different between sites and regions. Salt Bay was similar, both in species composition and functional trait clustering, to other sites in Casco Bay. Temperature, especially cold winter temperatures, was found to drive trait clustering, with colder temperatures 3-months prior to collection indicating similarities between the traits held in the community. This finding differed slightly from the literature, which often focuses on high temperatures leading to stress within a community.

The Grua/O'Connell fellowship funded my attendance of the Benthic Ecology Meeting in Miami, FL. At the conference I was able to present my research as a talk, receiving feedback from other scientists. I was also able to network, talking to current graduate students and potential Ph.D. advisors about research ideas and connections among our work. To name a few, I talked to Brad Peterson, a community ecologist working at Stony Brook University, and was invited out to his lab on Long Island this summer as I think about my Ph.D. position. I spoke at length to Jon Lefcheck, who has pursued similar research to my own, and got his feedback and shared ideas about the overlap of our research ideas and interests. After my talk, I also was invited to apply to Florida Atlantic University for my graduate studies.

Finally, I was able to share my research with Coastal Rivers Trust, the managing agency of Salt Bay, providing them with a poster for their visitor station and blog post for their website explaining the importance of the MPA to the broader community. Sharing my research not only promotes the essential marine ecosystem that I studied, but allowed me to practice my science communication skills, which are critical to my future career in ecology.

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